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INTERNATIONAL GEOGRAPHICAL UNION

REPORT

OF THE

COMMISSION FOR THE STUDY OF POPULATION PROBLEMS

PREPARED FOR THE

INTERNATIONAL GEOGRAPHICAL CONGRESS

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REPORT OF THE COMMISSION FOR THE STUDY OF POPULATION PROBLEMS

PART I

The Commission was appointed at the International Congress of 1949, at Lisbon, in succession to the previous Commission on this subject. The President was C. B. Fawcett (Great Britain), but since he resigned soon afterwards, A. G. Ogilvie (Great Britain) was appointed by the Executive Committee of the Union, after considerable delay, to succeed him. In 1951 R. Biasutti (Italy) was appointed an additional member. The composition of the Commission, therefore, is :—

President : A. G. Ogilvie (Great Britain).
Secretary : F. Milone (Italy).
Members : R. Biasutti (Italy); B. Brouillette (Canada); G. T. Trewartha (United States).

The terms of reference were :—

I. Sources for the study of population problems;
II. Cartographic representation of facts about population;
III. Rural population;
IV. Urban population;
V. Migration.

The work of the Commission has been retarded on account of the change in the Presidency, great delay in the transference to the Secretary of the archives collected by the Secretary of the previous Commission who was in the East Indies, and to difficulties of travel. It proved impossible to hold a full meeting; but the President, the Secretary and Mr. Brouillette met in Paris in March 1951, and with the approval of the other Members made an Interim Report to the Union in the following terms:

I. Sources for the Study of Population Problems

It is desirable that future censuses should include more data that can be of use to geographers. Consequently it would be helpful if such defects were stated so that a general review of the sources could be made and remedies suggested to the respective governments with the authority of the I.G.U. Geographers should note that the Demographic Yearbook, published by U.N.O., serves some of their purposes.

II. (is discussed below).

III. Rural Population

On this subject the Commission sought to encourage the preparation of brief monographs describing, more especially in restricted areas, the life of the agricultural population with special regard to the density of the rural population as affecting physical and human factors, such as nutrition, housing, labour, land ownership and operation, the crops raised and the degree of farming activity, malaria and other specific diseases, the centralised or dispersed character of the undertakings, season migrations, etc. Briefly, these monographs should supply summary but accurate information on the living standards of rural population so as to allow of comparisons showing the influences of physical and social factors on rural life in regions in different parts of the world and belonging to different civilisations. The Commission hoped that this would help in recognizing the agricultural areas that may be considered over-populated.

IV. Urban Population

The Commission wished also to promote the preparation of monographs on urban geography in respect of towns varying in climate, geographical situation, function, degree of civilization, standard of life, etc. The Commission hoped that such information would lead to a clear identification of the towns that are obviously over-populated in relation to the means of obtaining a living and where the standard of life of the majority is low.

V. Migration

Many former studies of migration have been made largely from the socio-economic standpoint, and the Commission would welcome from geographers results of thorough investigations concerning small areas (Department, County, Commune, etc.), studied with due attention to conditions prevailing in the past, upon subjects such as: the numerical importance and final balance of population; causes in relation to the standard of living; consequences of migration; real and lasting transformation of the local landscape, etc. It is further greatly to be desired that geographers devote themselves to assembling and presenting accurate data on migration, over large areas, in recent times (1918-1939, and since); it is most important to attempt to assess the geographical consequences of such movements.

II. Cartographic Representation of Facts about Population

While the Commission recognised that there are many aspects of population problems that require mapping it considered that the fundamental fact is the distribution of density. It therefore envisaged two distinct enquiries; the first (*a*) necessarily representing a long task; the second (*b*) a more urgent and rapid one.

(*a*) The aim was to consider whether it is feasible to construct maps of population-density on the base of the International Map; and the action of the Commission in this subject is discussed in Part II of the present Report.

(*b*) It becomes evident that there is great need for an Atlas of the World's Population which should have the widest possible circulation. This should contain maps of the world, of the continents as well as sub-continental divisions and possibly smaller regions, to show the distribution of population-density by reference, first to the total administrative area and secondly, to the area of agricultural land within the political unit. It may be possible also to give some representation of the patterns of distribution and of the facts of migration. Descriptive texts and supplementary statistical diagrams would accompany the maps. In view of the relatively small scale of the maps in such an atlas they would probably amount to cartograms in respect of all the more densely peopled regions, and so could be constructed with the minimum of delay.

The Commission decided that, in view of the shortness of time available, it would confine its efforts to the investigation of the problem of mapping density of population. Nevertheless, it appealed in the Interim Report for the presentation of communications on all the subjects mentioned above, and it hoped that by the circulation of the Interim Report, through the various National Committees, it would receive material for a general report on each subject. It would appear, however, that this appeal did not become widely known and as the response has been insignificant, the Commission has decided to devote the remainder of its Report to the mapping of population. Moreover, even in respect of this subject it is unfortunately not in a position to present a considered report. While the time available has sufficed for the compilation of a number of experimental maps, there has been no opportunity for a meeting of the Commission to study them. The Commission invited certain Corresponding Members to make their contributions to the experiment, while one of the Members, G. T. Trewartha, was able both to contribute himself and to instigate and give general supervision of the experiments of three contributors in the United States. The President undertook the correspondence with these gentlemen and he therefore submits, as Part II of this Report, a statement on the maps to be presented to the Congress at Washington. But, again unfortunately, he has been able to see the finished maps in only two cases. The account therefore had to be based mainly upon his correspondence with the contributors.

The Commission wishes to express its indebtedness to those who have assisted it in this way as Corresponding Members:—Professor G. Chabot, University of Paris; Professor W. Hartke, University of Frankfurt-am-Main; Professor A. C. O'Dell, University of Aberdeen; Dr. A. Söderlund, Kartredaktor vid Generalstabens Litografiska Anstalt, Stockholm; Professor J. Ch. W. Verstege, Central Bureau voor de Statistik, den Haag; as well as to the following gentlemen who have worked at the instigation of Professor Trewartha:—Professor W. Zelinsky, University of Georgia; Mr. Albert L. Farley and Mr. Reginald G. Marshall, University of Wisconsin; and, finally, to Dr. Mihailo S. Radovanović, School of Education, Belgrade, whose general suggestions on the mapping of population bear upon the question of an Atlas of Population.

In default then of a considered report the Commission submits the results of its work in the form of maps to be exhibited at the Congress in the hope that the discussion during the sessions at Washington will carry this matter to a further stage.

signed ALAN G. OGILVIE, *President.*

FERDINANDO MILONE, *Secretary.*

INTERNATIONAL GEOGRAPHICAL UNION

REPORT OF THE COMMISSION FOR THE STUDY OF POPULATION PROBLEMS, 1952

PART II

THE MAPPING OF POPULATION, ESPECIALLY ON SCALE 1/M

By A. G. Ogilvie
(President of the Commission)

In view of the general interest displayed at the Lisbon Congress of 1949 in the use of the International Map 1/M as the base for various geographical distributions, the Commission felt justified in promoting new experiments in mapping population on this scale; and certainly there can scarcely be any distribution more important than this. It is therefore assumed that the distribution of population over any sheet of this map would ultimately be represented by overprinting on elements of the existing map which might include the black and the blue plates perhaps to be printed in grey; but in any case, the main use of colour would be reserved for the "population." The publication, in 1947, of the map of the *Danube Valley and Adjacent Territories*, 1/M, by seven Hungarian cartographers [1] showed that the distribution of population could be represented clearly by overprinting on a map already fully printed with the international hypsometric colouring, if the so-called "absolute" method is used, *i.e.* with discs of varied size which in this case were printed in mauve. Moreover, the merits of this method of mapping population, but with "spheres" for the towns, had been amply demonstrated by S. de Geer in regard to Sweden (1917) and by A. Söderland for Norway, at the scale 1 : 500,000 and with the smallest disc representing 100 persons; Söderlund again used the method in his map of Europe (1926), 1/4M, but since the smallest disc there represents 5,000 persons the distribution shown necessarily lacks reality where population is sparse. Again the population-map in the *Atlas des deutschen Lebensraums in Mitteleuropa* employed this method using eight symbols, three in black and five in red. In view of these and similar published maps it might seem unnecessary to make further experiments in this direction, but several of the maps in the series now presented must be regarded as in this general category of "dot maps."

While it is assumed, as already stated, that all the methods employed in the experiments are suitable for overprints on the International

Map, only one of the manuscripts presented has actually been drawn upon sheets of this map, the sheet Norköpping with the base printed faintly on the tracing.

A. EXPERIMENTS USING POINT SYMBOLS

1. *Western Pennsylvania*, 1/M, by A. L. Farley and R. G. Marshall, based on the census of 1940. The general distribution is shown by black dots, $\frac{1}{50}$-inch in diameter, representing 50 persons, with towns in red; an inset map classifies towns by population, using red discs of four grades from 2,500 to 100,000 and open black circles for larger cities.

2. *Norköpping* (*Sweden*), *N-O* 33 *of the International Map*, by A. Söderland. This represents an interesting experiment in several respects. The author, realising the importance of the relation between population and food-production proposes that the base-map, where possible as in this case, shows the cultivated area as a minimum, and preferably other cover or uses of land as well. Secondly, he has provided schemes for reproduction of the complete map in 3, 4, 5 and 6 colours respectively. To demonstrate the use of these, in so far as population is concerned, the sheet is divided into four quarters in which 1, 2, 3, 3 colours are used respectively. The shape and size of the symbols indicate the character of agglomerations, cubes and spheres being used as alternatives for larger places. In response to a suggestion that while still keeping to the "dot method," colour of the symbols might be made to give a general idea of relative density, Dr. Söderlund added "supplement 2" to his "Explanation."

3. *Departements of France: Seine inférieure and Seine et Marne*, 1/M, by G. Chabot. These two Departments were selected as showing considerable contrasts in the arrangement of population. This the map will bring out well since the discs, each representing 100 persons, will be coloured according to the degree of concentration. The method of construction is as follows. Dots for 10 persons each are plotted at scale 1 : 80,000 and on a photo-reduction of 1 : 200,000 the dots are coloured to show: (*a*) isolation; (*b*) concentration up to 100; or (*c*) to over 100 persons. On the 1/M scale ten of these are replaced by a single coloured disc.

The map described as 4*b*, below, belongs to this category.

B. CARTOGRAMS OR STATISTICAL REPRESENTATIONS OF DENSITY

The well-known map of population-density of France in the *Atlas de France* in four sheets, 1 : 1,250,000, by communes, is an excellent example of this type. The advantage of the method, statistical accuracy and its defect—assumption of uniformity throughout each administrative unit—are both obvious. The experiment just described (A3) will, if extended, provide a valuable supplement to this map. The map of France is particularly interesting on account of the colours used: yellow for communes whose density approximates to the average for the whole country, shades of blue for those below and shades of red for those above.

4*a*. *Netherlands*. Population Density in 1947, 1 : 600,000. While no experiment was needed with this type of population map, it is important to record the opinion of Dr. J. Ch. W. Verstege, a Corresponding Member of the Commission, that there is no satisfactory solution to the problem of showing density except by administrative units. He therefore presents this official map of the Netherlands [2] showing density, in six grades, by municipalities. He points out, however, that in the case of certain municipalities having marked differences of density within their areas these have been subdivided; and he states that with much labour this principle could be carried farther.

4*b*. *Netherlands* 1 : 600,000, the counterpart of the above, shows the distribution by four graded symbols. This was published in relation to the National Plan of the Netherlands.

The experimental maps: 11*a*, 11*b* and 11*f*, described below, belong to this category.

Reference should be made here to the very well produced map of the population of Japan in 1930 by S. Inoue on the scale 1/M, which is based upon the smallest administrative units.[3]

C. ISARITHMIC OR ISOPLETH MAPS

Notable examples of published isarithmic maps of population-density are those of Italy, the first by R. Almagià on scale 1/3·5M, with seven grades of density[4]; the second by R. Riccardi, 1/2·5M, with nine grades.[5] Professor R. Biassutti's view, favourable to this method, will be quoted later; meanwhile attention is drawn to an experimental map made in this way.

5. *Gold Coast*, 1/M, by A. L. Farley and R. G. Marshall, with six grades of density. This map certainly rests on data of a different order from those relating to Italy and the authors have appended a diagram giving their estimate of their reliability. Another new map of the Gold Coast now presented (D7) is described below and if the same topographic and censal data were used in the two cases, the comparison will prove interesting.

D. DASYMETRIC-CHOROPLETH MAPS

It appears necessary to use this rather clumsy expression to designate maps in which the aim is to make density measurable while also showing the limits of areas of given density more realistically—more truly geographically—than by using the above methods "B" or "C." But as both of these classes are also dasymetric the real distinction lies in the drawing of more or less arbitrary "choropleths" instead of isopleths or of using the administrative (censal) boundaries. Many such maps have been published varying greatly in style and in scale, including the most ambitious effort in the mapping of population ever attempted, the Dasymetric Map of European Russia, 1 : 420,000 with density shown by fourteen colours. This was due to B. Semenov-Tian-Shansky, who seems to have invented the term "dasymetric" (from Greek *dasis*—density), and P. A. Palchinsky.[6] As the map required 145 sheets it was evidently an expensive undertaking; further reference to it will be made later.

Three new "chloropleth-maps" have been prepared as part of the present experiment and two more are presented as having useful bearings on the problem in view, while other published maps will be mentioned.

6. *Population of Greece*, Census of 1928, 1 : 1,750,000, by A. G. Ogilvie.[7] This is taken first because of the simplicity of its method in principle, although defects in the topographic map (1 : 100,000) created some difficulties. While the areas are delimited chiefly by crests of mountains, including those which enclose plains, the "choropleths" probably coincide generally with communal boundaries. The map therefore represents broadly a geographical grouping of the communes. A few high summits are eliminated as well as the ten towns with over 10,000 inhabitants. The areas consisting mainly of plains are enclosed by double lines; but if overprinted on a topographic base, this would be unnecessary. The map was compiled at 1/M.

7. *Gold Coast*, 1/M, by A. C. O'Dell. This map has been prepared from the census of 1948, and with use of topographic maps of various scales. Villages within each administrative district were marked on a tracing at 1 : 250,000, with their population and grouping in the census and unsettled areas delimited. Boundaries ("choropleths") were then drawn between areas obviously differing in density. The areas were planimetred and the densities computed. Upon reduction to 1/M certain minor differences disappeared. Density is shown in seven grades.

8. *Southern British Columbia*, 1/M, by A. L. Farley and R. G. Marshall. This provides an interesting example of mapping a distribution that is essentially linear in character. Rural density is shown in eight grades and urban agglomerations in three categories. No detailed information has been furnished regarding the method of construction, but the census of 1941 was used.

9. *Density of Rural Population of Bengal in* 1931, 1/M, by A. Geddes. This map will be exhibited in manuscript with density shown in nineteen grades by colour. A part of it was published in black, using numbers and four grades of rulings.[8] The author treated the urban population on a separate map, but the two maps could be combined, by the superimposition of graded circles or spheres representing the population of the towns, upon the map of rural density.

This map is notable because of the way in which the areas of density are made to accord with geographical reality upon deltaic plains where density is controlled by minor features of relief and by hydrography; and this was attainable by the choropleth method alone. The author demonstrates, by means of a simple formula, that within each small administrative area the total population remains unaltered but that it has been redistributed within such areas to accord with the facts revealed by the topographic maps.

This question of the use of formulae in drawing choropleths suggests reference at this point to other similar maps. J. K. Wright discussed this method of mapping in 1936, giving Cape Cod as an example [9] and published a table for solving the fundamental equation without either multiplication or division. Doubtless the map showing the distribution of population in New England (1/3M) was made in the same way.[10]

The Population Map of Great Britain, 1/M, published by the Ordnance Survey in 1934 in two sheets, is an effective example of the use of a similar method and it gives a good idea of its possible extension to other sheets covering Europe. This map was subsequently developed on a larger scale (1 : 625,000) and issued in 1947.

10. *Savannah Sheet of the International Map*, N.I. 17 (including S. Carolina and parts of other States), by W. Zelinsky. This map, which is the subject of a communication to the Washington Congress, represents an interesting effort to demonstrate that methods "A" and "D" of this Report are not mutually incompatible, as seems generally to have been assumed. Most of the sheet-area consists of—for the U.S.A.—moderately dense, and some dense, rural population, but also forest and marsh, as well as an industrial belt. So the combined method is here given a fair test. Rural population was first located and plotted by black dots for 50 persons. Choropleths were then drawn in relation to the relative closeness of these and coloured in seven grades of density. Population of towns is shown by graded discs of a distinctive but transparent colour and the shapes of the larger towns are also drawn. The census of 1950 was used.

In concluding this account of "dasymetric-choropleth" maps, it is proper to revert to the series of 145 sheets of European Russia (1 : 420,000) which began to appear in 1923, and to mention that the author announced, about that date, the preparation of a similar population-map of the U.S.S.R., the European part to be on scale 1/M. I have seen none of these maps; but fortunately the late Sten de Geer reviewed the European map after 28 sheets had been issued.[11] Data for population in Russia at this period were perhaps not unlike those of many other lands to-day. No census had been taken since 1897, so figures were amended to represent natural increase up to 1915. But it is more interesting to record here the method by which (according to de Geer) Semenov-Tian-Shansky and Palchinsky drew their choropleths, since this may have some value for other territories. The census enumerated all towns and villages down to 500 inhabitants, smaller places being included in the totals for rural administrative areas. The outer edge of cultivated land or the tract of a really continuous population was delimited as follows. Around all inhabited places named on the 10-verst map circles of 1-verst radius were drawn, because the fields of the villages are usually within this distance. Groups of these circles were then linked by smooth curves. De Geer considered that this was a reasonable way of reducing many patches alike in character to larger units where the real boundary was not known.

Categories, or Grading, of Density

It is premature to attempt discussion of this subject; but since the various maps presented or referred to, other than the "dot-maps," exhibit different choices of boundaries between categories, it is clear that the subject must be discussed fully before any co-operative scheme of mapping is attempted. Some authors have used arithmetic or geometric progression; others again have made arbitrary choice, guided by the general characteristics of population-density in the country concerned. Semenov-Tian-Shansky, for example, used a regularly ascending scale by tens to 100, then 200, 500 and 1,000 per sq. verst (10 to sq. v.=22·5 to sq. mile). In all these cases it may well be argued that, instead, their decision should have rested upon frequency as disclosed by construction of a frequency graph.[12] But in any case the problem will not be easy to solve for the construction of maps in many sheets covering a large area. It would appear that the maps of the U.S.S.R. should be worthy of special study in relation to this subject.

11. *Seven Cartograms of Population in Hessen*, by W. Hartke. These cartograms are the subject of a separate communication to the Congress.[15] The first five are on scale 1 : 800,000 or more and show distributions by *Gemeinden*, in great detail since most of these are very small; two are on the 1/M scale, using the *Kreis* and so represent the facts much more crudely.

11*a* and 11*b* show population-density in 1950 and in 1939 respectively, using seven grades of colour and without any special symbols for towns; these maps together emphasise the generally considerable increase in population for the period.

11*c* and 11*d* are maps of *Wohndichte*. This does not mean density of dwellings per unit area, but the average number of persons occupying given amounts of floor-space in houses, in 1950; so the cartograms present relative population-density in dwelling-houses, or "house-crowding." The two maps represent alternative modes of calculating the floor-space. The former, which is on 1 : 600,000 and reproduced in black only, taking "living-room and kitchen" into account, the latter, on 1 : 800,000 and coloured, is based on "living-room and bedroom." Both show six grades of density: they differ in the two cases, but all represent decimal values between one and two persons per unit. This unit is very small by usual civilised standards and indicates generally the phenomenon of overcrowding. The problem of housing and employing the vast influx of refugees from East Germany was in fact the reason for the investigation that resulted in these maps and, as the author points out, they demonstrate very clearly one striking fact. It is not the districts with very great total population that display the greatest overcrowding in houses but those—generally rural—districts which on the population-density map of 1939 were relatively thinly peopled. Even in 1950 "house-crowded" areas still show relatively low densities per km².

11*e* illustrates one of the consequences of this situation, the vast movement of people to their daily work. It shows the *Pendelwanderung* (1950), *i.e.* percentage of the population who commute, in five grades of which the highest is over 20 per cent. The cartograms 11*f* and 11*g* on scale 1/M show respectively, by *Kreise*, population-density and *Wohndichte* in 1946.

While the maps of "dwelling-space" were prepared to meet a pressing social problem the author believes the method to be applicable generally and, moreover, that it offers the most valuable aim of future population-mapping. Further allusion to the matter is therefore made at the end of this Report.

12. *Density of Types of Settlement in Sweden*, by the Geographical Institute of Uppsala University. Professor G. Enquist hopes to present a communication on this map which is in preparation as part of the projected Atlas of Sweden. A sample of it has been published (c. 1/2M)[13] in the form of three separate maps in black showing: (*a*) three degrees of intensity of cultivation; (*b*) density of habitations, in three grades; (*c*) types of grouping of homesteads. The intention presumably is to combine all three, by the use of colour.

Review and Conclusion

The International Geographical Union will do well to consider, first, how inadequate are the population-maps now at the disposal of geographers, and secondly, how essential such maps are, not merely as a basis of geographical research, but also for practical purposes. In relation to the second point, it would seem that the Union has a double duty to perform. It is for the Union to demonstrate to the United Nations Organisation the fundamental character of population distribution in many of the projects of the United Nations; and further to be in a position to advise in the production of population-maps. If the Assembly of 1952 should take this view, the Union will naturally also consider the matter in relation to its own projects, and particularly that of the World Land Use Survey. It is surely of the greatest importance to know the capacity of each type of land to support population under present conditions, especially in regions with a "subsistence economy"; in other words, the maps of land-use and of population should be made and used together. Moreover, since comparisons will be made between one region and another there would seem to be a strong argument in favour of a system of population-mapping which easily permits the comparison of *density* either per unit area or per unit of cultivated land. For this reason reliance should not be placed solely on the so-called "absolute" method of mapping by dots.

Experiment has been directed mainly to the scale of 1/M because it seems a worthy ideal that population should ultimately be represented on the uniform base of the International Map, or upon other maps of this scale. But even the few maps prepared have shown that for areas of small population-density, *e.g.* British Columbia, this scale is unnecessarily large. Again, there are vast regions for which the detail of topography and the statistics are insufficient to justify the effort and the expense of reproduction on the 1/M scale. Therefore it seems desirable to devise a method of mapping population such as could be used on smaller scales, preferably with simple relationships to the 1/M. With this in view the various methods may now be reviewed in turn.

The dot method, despite the defect already mentioned, has the great advantage that it normally requires only one printing on a map, so it may be examined first. If it be employed on the 1/M scale with uniform dots for rural population and proportional spheres or other symbols for towns, the dot value suited to one region turns out to be too low or too high for others. As already noticed, the dot valued at 50 is suitable to the Savannah map but would be unsuitable to the Bengal map. Increasing size and value for the dots, however, is permissible and has been shown to be successful in the published Danube Valley map. Therefore it would seem that the method is reasonably suitable to this scale. But further experiments are required, and they should include the use of more than one colour on the lines of Söderland's experiment to meet the possible failure owing to congestion of dots. On the other hand, with reduction of map-scale the representation of rural population by dots seems to become less and less realistic; so the method does not meet the need for a system of mapping that is comparable on the various scales.

Turning now to methods representing density, the simple cartogram may be considered first. The maps of Hessen illustrate this for the scale 1 : 800,000 in its most detailed form, on account of the small average size of the administrative units; for smaller scales presumably the *Kreis* would be used instead of the *Gemeinde* and so whatever scale and whatever the region such cartograms offer a simple means of covering many countries quickly. The only important decision to be taken would relate to the graded scale, or scales, of colour to be adopted and this will be referred to below. The case for the use of the isarithmic or isopleth method for showing the density of rural population has been made by a member of the Commission, R. Biasutti, in a communication which he has submitted. He regards the chief merits of maps made in this way as, first, their clearness, and secondly, their avoidance of the personal element in compilation, while he considers that the method does not imply a departure from reality, if "reality" be considered as "the most probable expression of the localisation of the population in a given space"; this because population often gravitates toward the administrative centre. He emphasises, however, that method is the more effective, the smaller the administrative areas, since the isopleths are drawn by the purely mathematical rule of interpolation between administrative centres.

It is probably true that such isarithmic maps gain in effectiveness by reduction in scale. Therefore the method may be thought to have special importance where uniformity as between different scales is sought. Biasutti concedes that such maps have little value as statistical documents, but believes that they have great value as readable representations of a phenomenon of life. Finally, he points out the simplicity with which density gradients may be made to suit regions differing in their general densities; since the method allows a generally agreed colour-scheme to be maintained while any number of isopleths may be inserted, when required, between the colour boundaries.

The protagonists of the "dasymetric-choropleth" method have usually adopted it because it provides for abrupt changes of density which often are very real on the ground, whereas the isopleth method represents density as changing by regular gradients which are unusual. They do not claim for it complete statistical accuracy but urge its geographical value in that the choropleths may be drawn to coincide with physical features such as break of slope, spring lines and the like which often greatly influence density of population. Moreover, as Geddes pointed out, the total population within the administrative unit is given its proper value, but density is redistributed more realistically within the unit. The important point is that the method represents a refinement of the statistical cartogram; and all degrees of refinement are possible, starting, *e.g.*, with the grouping of small administrative units to fit areas of similar character, as in the map of Greece. Therefore it seems to possess special advantages in relation to any wide project of population-mapping at the present time. Thus if a scheme of density grading can be devised to suit all regions, it may be used both for statistical cartograms in respect of regions where detailed information is poor and for "dasymetric-choropleth" maps where information is adequate for their construction. Moreover, the two methods may be used for different parts of the same map-sheet for which the information is unequal.

It would seem likely that the greatest difficulty will lie in devising a scheme for printing density-grades that is applicable to all regions. To reduce this difficulty one decision would seem both desirable and inevitable, viz. that graded density be used only for *rural* population, *i.e.* with towns eliminated from calculation and that urban population be represented by open circles or other symbols. Incidentally this procedure is equally indicated in the case of isopleth maps.

Much experimentation would be needed before such a colour-scheme is established. In view of the great range of rural density to be found, from those of Bengal or parts of China and Japan downwards, it would seem well to start by using the whole range of the spectrum and several shades of each colour. Then, with a view to economy, a rational plan of reduction in the number of shades might be devised. But whatever be the nature of the experiments, they should have general application both to maps of scale 1/M, in which the fullest gradation would appear, and to smaller scales, probably with smaller numbers of grades. Moreover, to meet the possibility of need for the maximum financial economy, provision should be made for the use of stipples and rulings to be printed in one colour only. Here the number of grades would be still more restricted; but they should have an established relationship to the full colour-scheme.

It may well appear that any very ambitious plans for population-mapping are inappropriate under present economic conditions, and certainly this is true in many countries. Nevertheless, the Commission hopes that the International Geographical Union will regard the promotion of widespread population-mapping in some form as a matter of urgency, and that it will give the weight of its authority in representing this to the United Nations Organisation. The preparation and publication of statistical cartograms, which scarcely calls for the professional skill of geographers, may be regarded as a matter of cartographic routine. But the Union should offer advice on the scheme of density-grades. On the other hand, the refinement of cartograms may be urged strongly, and this requires geographical skill. Is it therefore not reasonable to hope that geographers, who appear to have neglected this duty for many years, will again turn to it as a necessary part of their work? At any rate and whatever the final mode of cartography, they should take steps in the first place to ensure that the governments in their respective countries produce base-maps, on suitable scales, showing the boundaries of the smallest censal areas, and that these maps are made available to all geographers either as printed maps or as micro-films of drawings. The great bulk and cost of many published censuses creates a serious difficulty for workers in this field; but this might surely be largely met by the organisation, at some suitable centre, of a system of micro-filming of essential parts of these documents and the circulation of the relevant sections to accredited geographers.

The Commission's experiments in mapping-population on the 1/M scale may conceivably arouse interest, but lead to no further effort on account of the natural objection that costs of reproduction are too great, especially in view of the fact that maps will tend to become out of date quickly. But geographers should give thought to the possibility of limited reproduction without normal printing. Certainly, to attain its full usefulness a map must be printed and published. But for purposes of geographical research and teaching the use of colour-photography can be made to go a long way. It is submitted that the effort of compilation and drawing would be worth while and the cartographer amply rewarded by the gratitude of other geographers if his map were circulated widely in the form of small coloured films. This has been done in the case of some of the experiments described in this Report, and it would require only a simple organisation to make such a scheme generally effective.

To return, however, to the matter of maps that may be made and reproduced by printing within a reasonable time. It has been mentioned in Part I that the Commission recognised the need for an Atlas of World Population and it hopes that this aim may be realised with international co-operation; and the questions raised above regarding the use of scales smaller than 1/M have obvious bearing upon this subject. The decision about scales would have to be made, along with that about method. It is therefore appropriate, as a basis for discussion, to refer to a communication which the Commission has received from M. S. Radovanović.[14] He suggests that the scale 1/M be reserved for densely peopled regions such as the industrial areas of Europe, north-eastern U.S.A., U.S.S.R. and Japan, as well as Egypt, Java, the Great Lakes Region and Central Mississippi Basin, Southern California, and the more developed parts of Brazil and Argentina. It would appear that he has in mind special maps of these, and not sheets of the International Map. He considers that the scale 1/2,500,000 would be most suitable for most parts of the world; but that the thinly populated regions of great extent should be represented on the scale 1/5M or even 1/10M.

It is fitting to conclude this Report by further reference to the important communication to be presented at Washington by W. Hartke, since he questions the value of the principle hitherto generally accepted as the basis of population-mapping, and doubts the wisdom of renewing efforts in this direction.[15] In view, presumably, of the uneven and unmeasurable degree of man's real economic dependence upon the area of land allotted to him, as by a calculation of density per km^2, the author prefers to seek a relationship that is clearly measurable and real, viz. that between the total population and its "living-space" in houses, thus conveying the idea of population-pressure on housing and not upon land. The thesis has been evolved to meet a special problem of over-population, but it is suggested that it should be possible to formulate the conception in such a way that it would have a world-wide application. To this end assurance would of course be required that the necessary statistics of housing were given in all future censuses. It is to be hoped that at the Washington Congress opinion on this matter will be clearly expressed. If the author's views should be generally accepted, it is desirable that an estimate be made of the period that must elapse before this method of mapping could be widely adopted. If a long one, delay in decision to promote cartography on the lines already indicated would not seem to be justified. Even if there be some unreality about population-density, this does surely in great measure furnish a basis, that is now largely lacking, for comparative studies in the geography of mankind.

REFERENCES

[1] G. Bogar, A. Kez, A. Ronai, J. Takes, F. Tallian, G. P. Teleki.

[2] From Twelfth Census of the Netherlands, Population and Housing, Ser. B, vol. 1.

[3] S. Inoue: Die Bevölkerungsverteilung Japans im Jahre 1930. *Wiss. Veröff. des deutschen Museums f. Länderkunde zu Leipzig* N.F. 4, 1936.

[4] In *Encyclopedia Italiana* (article "Italia"), also *Riv. Geogr. Italiana* 1933.

[5] In *Atlante fisico-economico d'Italia* (T.C.I.) 1939.

[6] B. Semenov-Tian-Shansky, edit. *Dazimetricheskaya Karta Evropeiskoi Rossii* (*Carte dasymétrique de la Russie d'Europe*), 1 : 420,000, Inst. d'Etudes "Le Sol et le Sous-Sol," Leningrad, 1923- .

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[7] A. G. Ogilvie, "Population Density in Greece," *Geogr. Journ.*, London, vol. 101, 1943, pp. 251-260.

[8] Arthur Geddes, "The Population of Bengal: Its Distribution and Changes," *Geogr. Journ.*, London, vol. 89, 1937, pp. 344-368.

[9] J. K. Wright, "A Method of Mapping Densities of Population," *Geogr. Rev.*, New York, vol. 26, 1936, pp. 103-110.

[10] J. K. Wright (Editor), *New England's Prospect*, 1933, Amer. Geogr. Soc., New York, 1933, pp. 22-23.

[11] In *Geogr. Rev.*, New York, vol. 16, 1926, pp. 341-343.

[12] Cf. J. W. Alexander and G. A. Zahorchak, "Population Density Maps of the United States: Techniques and Patterns," *Geog. Rev.*, vol. 33, 1943, pp. 451-453.

[13] G. Enquist, "En Karta över Sveriges Bebyggelsebild," *Ymer*, 1950, pp. 181-206.

[14] M. S. Radovanović (of Belgrade), "A Short Exposition on the Question of the Mapping of Population on the 1/M Map."

[15] W. Hartke, "Volksdichte oder Wohndichte? Beitrag zur Frage der Kartographischen Darstellung der Bevölkerungsverhältnissen."

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